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## TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/939,848
Filing Date	August 27, 2001
First Named Inventor	Blalock et al.
Group Art Unit	2879
Examiner Name	S. Leurig
Attorney Docket Number	2269-3578.1US (92-0555.00/US)

### ENCLOSURES (check all that apply)

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### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Brick G. Power	Registration No. 38,581
Signature		
Date	December 27, 2004	

### CERTIFICATE OF MAILING

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Blalock et al.

Serial No.: 09/939,848

Filed: August 27, 2001

For: FIELD EMISSION TIPS AND  
METHODS FOR FABRICATING THE  
SAME

Confirmation No.: 3166

Examiner: S. Leurig

Group Art Unit: 2879

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APPEAL BRIEF

Mail Stop Appeal Brief—Patents  
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Attn: Board of Patent Appeals and Interferences

Sir:

This Appeal Brief is being submitted in the format required by 37 C.F.R. § 41.37(c)(1),  
with the fee required by 37 C.F.R. § 41.20(b)(2).

I. REAL PARTY IN INTEREST

U.S. Application Serial No. 09/939,848 (hereinafter “the ‘848 Application”), the application at issue in the above-referenced appeal, has been assigned to Micron Technology, Inc., as evidenced by the assignment that has been recorded with the U.S. Patent & Trademark Office (hereinafter “the Office”) at Reel No. 010764, Frame No. 0096. Accordingly, Micron Technology, Inc., is the real party in interest in the above-referenced appeal.

II. RELATED APPEALS AND INTERFERENCES

Neither Appellant nor the undersigned attorney is currently aware of any appeals or interference proceedings that would affect or be affected by the Board’s decision in the above-referenced appeal.

III. STATUS OF CLAIMS

Claims 1-26 are currently pending and under consideration in the above-referenced application.

The Office has indicated that claims 16 and 24 recite allowable subject matter, but has objected to these claims because they depend from rejected base claims.

Claims 1-15, 17-23, 25, and 26 stand rejected. The rejections of claims 1-23 are being appealed.

IV. STATUS OF AMENDMENTS

The '848 Application was filed with twenty-six (26) claims on August 27, 2001, as a divisional of U.S. Application Serial No. 09/559,153.

A Preliminary Amendment was mailed on November 27, 2001, to correct errors in the specification and claims.

On March 26, 2003, a first Office Action was mailed. All of the claims were rejected. The Examiner also objected to the drawings.

A Response followed on June 26, 2003, and received a filing date of June 30, 2003. In the response, claims 1, 7, 11, and 19 were amended. Drawing corrections and an amendment to the title were also presented.

In a Final Office Action dated September 3, 2003, the Examiner presented new grounds of rejection against claims 1-26.

On November 3, 2003, an Amendment Under 37 C.F.R. § 1.116 was mailed. That Amendment received a filing date of November 7, 2003. In the Amendment, revisions to all of the claims were proposed, as was reasoning as to the patentability of each of claims 1-26 over the art upon which the rejections were based.

An Advisory Action followed on December 5, 2003, in which the Examiner refused to enter the amendments that had been proposed and maintained her prior rejections of the claims.

A Request for Continued Examination was filed on December 9, 2003, with a request that the previously proposed claim amendments be entered.

Another Office Action on the merits promptly followed on January 20, 2004. In that Office Action, the Examiner withdrew her previous claim rejections and rejected claims 1-26 on new grounds.

In response, a third Amendment was mailed on April 20, 2004, and received a filing date of April 23, 2004. Claims 1, 2, 7, 11, 14, 16, 19-21, and 24 were amended. These were the last amendments presented in the ‘848 Application.

A second Final Office Action followed on July 27, 2004, in which the rejections of claims 1-15, 17-23, 25, and 26 were maintained, and in which the Examiner indicated that claims 16 and 24 are directed to allowable subject matter.

A final attempt was made to convince the Examiner of the patentability of claims 1-26 in a document titled “Response to Final Office Action,” which was filed on September 30, 2004.

An Advisory Action followed on October 18, 2004. In the Advisory Action, the Examiner maintained her previous rejections.

Therefore, a Notice of Appeal was filed in the above-referenced Application on October 27, 2004.

This Appeal Brief follows the Notice of Appeal.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The ‘848 Application includes claims that are directed to emitter tips, field emission arrays, and field emission displays.

An exemplary emitter tip, which may be formed from a conductive or semiconductive material, includes a central region and a tapered portion. Figs. 4, 9, and 15; paragraphs [0009], [0029], [0033], and [0034].

The central region includes a substantially vertical sidewall around the periphery thereof, as well as an apex at an exposed end thereof. *Id.* The apex may be formed from a so-called “low work function” material. *Id.*; *see also* paragraphs [0013]-[0016].

The tapered portion surrounds the central region of the emitter tip. The tapered portion includes an inclined surface that extends toward the exposed end of the central region. The tapered portion may comprise re-deposited material. Figs. 4, 9, and 15; paragraphs [0016], [0031], [0033], and [0034].

The claimed field emission arrays may include a plurality of such emitter tips, while the claimed field emission displays may include multiple emitter tips, as well as additional features to facilitate display of images with the emitter tips. Fig. 17; paragraph [0035].

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

(A) Claims 1-4, 11-15, and 19-23 stand rejected under 35 U.S.C. § 102(b) for being directed to subject matter which is allegedly anticipated by U.S. Patent 5,647,785 to Jones et al. (hereinafter “Jones”).

(B) Claims 5-10, 17, 18, 25, and 26 are rejected under 35 U.S.C. § 103(a) for reciting subject matter which is purportedly unpatentable over the subject matter taught in Jones, in view of teachings from U.S. Patent 6,201,342 to Hobart et al. (hereinafter “Hobart”).

VII. ARGUMENT

A. REJECTIONS UNDER 35 U.S.C. § 102

Claims 1-4, 11-15, and 19-23 stand rejected under 35 U.S.C. § 102.

1. APPLICABLE LAW

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

2. REFERENCE RELIED UPON

*Jones*

Jones describes field emission tips 15 that have sidewalls 44 that are oriented perpendicularly (illustrated as vertically) relative to a substrate 11. The lower portion of each field emission tip 15 and, thus, the sidewalls thereof, are surrounded by an insulative coating layer 44. *See, e.g.*, FIGs. 6I and 7B through 9; col. 8, lines 26-36. The optional coating layer is also oriented perpendicularly relative to the substrate 11. *See* FIGs. 6I and 7B through 9. While an upper surface of each coating layer 44 may be inclined and, thus, tapered, the incline extends *away from* an exposed end of the emission tip 15. *See id.*

The tops of the field emission tips 15 of Jones include inclined surfaces, which form the apices 42 thereof. *See, e.g.*, FIGs. 6I and 7B through 9.

3. ANALYSIS

Independent claim 1 is directed to a field emission tip that includes a structure comprising a central region, a tapered portion surrounding the central region, and an apex at an end of the central region. The central region of the structure of amended independent claim 1 includes a substantially vertical sidewall, while the tapered portion includes an inclined surface.

Jones does not expressly or inherently describe, or anticipate, a structure with a central region surrounded by a tapered portion that includes an inclined surface that extends *toward* an exposed region of the central region, as required by independent claim 1. Instead, the inclined surfaces of the coating layers 44 that surround the emission tips 15 of Jones extend *away from* the exposed ends of the emission tips 15.

Therefore, independent claim 1 recites subject matter which, under 35 U.S.C. § 102(b), is allowable over that described in Jones.

Claims 2-4 are each allowable, among other reasons, for depending either directly or indirectly from claim 1, which is allowable.

Independent claim 11 is drawn to a field emission array that includes a substrate, at least one substantially pointed tip protruding from the substrate, and at least one element surrounding at least a portion of the at least one substantially pointed tip. The at least one element has a surface that tapers *toward* an exposed end of the at least one substantially pointed tip.

Jones does not expressly or inherently describe a field emission array with at least one substantially pointed tip surrounded by at least one element with a surface that tapers toward an

exposed end of the at least one substantially pointed tip. Rather, the coating layer 44 described in Jones includes an upper surface that is inclined so as to taper *away from* the emission tip 15.

Therefore, Jones does not anticipate each and every element of independent claim 11, as would be required to maintain the 35 U.S.C. § 102(b) rejection of independent claim 11.

Each of claims 12-15 is allowable, among other reasons, for depending either directly or indirectly from claim 11, which is allowable.

Independent claim 19 is directed to a field emission display that includes an anode display screen, a cathode spaced apart from the anode display screen, and a substantial vacuum between the anode display screen and the cathode. The cathode includes a substrate, at least one substantially pointed tip protruding from the substrate, at least one element surrounding the at least one substantially pointed tip, and a gate through which the at least one substantially pointed tip is exposed. The at least one element that surrounds the substantially pointed tip includes a surface that tapers *toward* an exposed end of the at least one substantially pointed tip. In addition, a voltage source is associated with the anode display screen, the gate, and the cathode to provide a potential difference between the cathode and the gate, and between the cathode and the anode display screen.

Again, the description of Jones is limited to a coating layer 44 that surrounds each emission tip 15 thereof and that has an upper surface that is tapered such that it inclines *away from* the emission tip 15, not *toward* it, as would be required to anticipate independent claim 19.

Therefore, Jones does not anticipate each and every element of independent claim 19, as would be required to maintain the 35 U.S.C. § 102(b) rejection of independent claim 19.

Claims 20-23 are each allowable, among other reasons, for depending either directly or indirectly from claim 19, which is allowable.

For these reasons, it is respectfully requested that the 35 U.S.C. § 102(b) rejections of claims 1-4, 11-15, and 19-23 be reversed.

B. REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 5-10, 17, 18, 25, and 26 stand rejected under 35 U.S.C. § 103(a).

1. APPLICABLE LAW

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

2. ADDITIONAL REFERENCE RELIED UPON

*Hobart*

Hobart teaches a field emitter array including a plurality of semiconducting nanomesas 14 disposed on a semiconductive substrate 12. FIG. 4; col. 3, lines 3-20. As shown, each of the nanomesas 14 has sidewalls that are oriented substantially vertical relative to the plane of the substrate 12, with no material surrounding the sidewalls. FIG. 4. Microscopic, three-dimensional, monocrystalline emitting regions, or tips 16, are formed on the nanomesas 14, and terminate in apices 18. FIG. 4; col. 3, lines 3-20. The tips 16, which may or may not be formed from the same material as the nanomesas 14, are deposited on the nanomesas 14 by epitaxial, vapor phase, self-assembled growth, which results in an atomically sharp apices 18. Col. 6, lines 40-43.

3. ANALYSIS

Claims 5 and 6 are both allowable, among other reasons, for depending directly from claim 1, which is allowable.

Independent claim 7 recites a field emission tip that includes a central region including a periphery with a substantially vertical portion, a tapered portion that surrounds and includes an inclined surface that extends toward an exposed end of the central region, and an apex at the top of the central region.

It is respectfully submitted that neither Jones nor Hobart, taken either separately or together, teaches or suggests a field emission tip that with a tapered portion that surrounds a

central region and that includes a surface that inclines toward an exposed end of the central region.

As Jones and Hobart do not teach or suggest each and every element of independent claim 7, it is respectfully submitted that the teachings of these references do not support a *prima facie* case of obviousness against the subject matter recited in independent claim 7.

Therefore, under 35 U.S.C. § 103(a), independent claim 7 recites subject matter which is allowable over that taught in Jones and Hobart.

Claims 8-10 are each allowable, among other reasons, for depending either directly or indirectly from claim 7, which is allowable.

Claim 18 is allowable, among other reasons, for depending directly from claim 11, which is allowable.

Claims 25 and 26 are both allowable, among other reasons, for depending directly from claim 19, which is allowable.

For these reasons, reversal of the 35 U.S.C. § 103(a) rejections of claims 5-10, 17, 18, 25, and 26 is respectfully requested.

#### VIII. CLAIMS APPENDIX

The current status of each claim that has been introduced into the above-referenced application is set forth in CLAIMS APPENDIX to this Appeal Brief.

IX. EVIDENCE APPENDIX

No evidence has been submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132.

Accordingly, no evidence appendix accompanies this Appeal Brief.

X. RELATED PROCEEDINGS APPENDIX

No decisions have been rendered by the Board or any court in a related proceeding/application. Therefore, this Appeal Brief is not accompanied by a related proceedings appendix.

XI. CONCLUSION

It is respectfully submitted that:

- (A) Claims 1-4, 11-15, and 19-23 are allowable under 35 U.S.C. § 102(b) for being directed to subject matter which is not anticipated by Jones; and
- (B) Claims 5-10, 17, 18, 25, and 26 are allowable under 35 U.S.C. § 103(a) for reciting subject matter which is nonobvious over the subject matter taught in Jones, in view of teachings from Hobart.

Accordingly, the rejections of claims 1-15, 17-23, 25, and 26 should be reversed, and each of these claims, as well as claims 16 and 24, should be allowed.

Respectfully submitted,



Brick G. Power  
Registration No. 38,581  
Attorney for Applicants  
**TRASKBRITT, PC**  
P.O. Box 2550  
Salt Lake City, Utah 84110-2550  
Telephone: 801-532-1922

Date: December 27, 2004

BGP/lb  
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Serial No. 09/939,848

## CLAIMS APPENDIX

1. A field emission tip, comprising a structure comprising at least one of semiconductive material and conductive material, the structure including:  
a central region including a periphery with a substantially vertical sidewall;  
a tapered portion surrounding the central region and including an inclined surface  
extending toward an exposed end of the central region; and  
an apex at the exposed end of the central region.
2. The field emission tip of claim 1, wherein a height of the at least substantially vertical sidewall exceeds a width of the central region.
3. The field emission tip of claim 1, wherein the apex comprises a low work function material.
4. The field emission tip of claim 3, wherein the low work function material is selected from the group comprising aluminum titanium silicide, titanium silicide nitride, titanium nitride, tri-chromium mono-silicon, and tantalum nitride.
5. The field emission tip of claim 1, wherein the apex has a lateral width of less than about 100 nm.

6. The field emission tip of claim 1, wherein the apex has a lateral width of less than about 50 nm.

7. A field emission tip, comprising a structure comprising at least one of semiconductive material and conductive material, the structure including:  
a central region including a periphery with a substantially vertical portion;  
a tapered portion including an inclined surface that extends toward an exposed end of the central region, the tapered portion surrounding the substantially vertical portion;  
and  
an apex at the exposed end of the central region, the apex having a lateral width of less than about 100 nm.

8. The field emission tip of claim 7, wherein the apex has a lateral width of less than about 50 nm.

9. The field emission tip of claim 7, wherein the apex comprises a low work function material.

10. The field emission tip of claim 9, wherein the low work function material is selected from the group comprising aluminum titanium silicide, titanium silicide nitride, titanium nitride, tri-chromium mono-silicon, and tantalum nitride.

11. A field emission array, comprising:

a substrate; and

at least one substantially pointed tip protruding from the substrate, the at least one substantially

pointed tip comprising at least one of a semiconductive material and a conductive material, the at least one substantially pointed tip including a periphery, at least a first portion of the periphery being oriented substantially perpendicularly relative to the substrate and at least a second portion at an end of the at least one substantially pointed tip of the periphery being oriented at an angle relative to the substrate to form an apex; and

at least one surrounding element including a surface that tapers toward an exposed end of the at least one substantially pointed tip and that surrounds at least a portion of the at least one substantially pointed tip.

12. The field emission array of claim 11, wherein at least the portion of the periphery is adjacent the substrate.

13. The field emission array of claim 11, wherein a height of at least the portion of the periphery relative to the substrate exceeds a width of the at least one substantially pointed tip.

14. The field emission array of claim 11, wherein the top portion of the at least one substantially pointed tip comprises a low work function material.

15. The field emission array of claim 14, wherein the low work function material is selected from the group comprising aluminum titanium silicide, titanium silicide nitride, titanium nitride, tri-chromium mono-silicon, and tantalum nitride.

16. The field emission array of claim 11, wherein the at least one surrounding element comprises redeposition material adjacent to at least the first portion of the periphery.

17. The field emission array of claim 11, wherein an apex of the at least one substantially pointed tip has a lateral width of less than about 100 nm.

18. The field emission array of claim 11, wherein an apex of the at least one substantially pointed tip has a lateral width of less than about 50 nm.

19. A field emission display, comprising:

an anode display screen;

a cathode spaced apart from the anode display screen, the cathode including:

a substrate;

at least one substantially pointed tip protruding from the substrate, the at least one

substantially pointed tip comprising at least one of a semiconductive material and  
a conductive material, the at least one substantially pointed tip including a  
periphery, at least a first portion of the periphery being oriented substantially  
perpendicularly relative to the substrate and at least a second portion of the  
periphery being oriented at an angle relative to the substrate;

at least one surrounding element that tapers toward an exposed end of the at least one

substantially pointed tip and that surrounds at least a portion of the at least one  
substantially pointed tip; and

a gate through which the at least one substantially pointed tip is exposed;

a substantial vacuum between the anode display screen and the cathode; and

a voltage source associated with the anode display screen, the gate, and the cathode to provide a  
potential difference between the cathode and the gate and between the cathode and the  
anode display screen.

20. The field emission display of claim 19, wherein at least the first portion of the  
periphery is adjacent the substrate.

21. The field emission display of claim 19, wherein a height of at least the first portion of the periphery relative to the substrate exceeds a width of the at least one substantially pointed tip.

22. The field emission display of claim 19, wherein a top portion of the at least one substantially pointed tip comprises a low work function material.

23. The field emission display of claim 22, wherein the low work function material is selected from the group comprising aluminum titanium silicide, titanium silicide nitride, titanium nitride, tri-chromium mono-silicon, and tantalum nitride.

24. The field emission display of claim 19, wherein the at least one surrounding element comprises redeposition material adjacent to at least the first portion of the periphery.

25. The field emission display of claim 19, wherein an apex of the at least one substantially pointed tip has a diameter of less than about 100 nm.

26. The field emission display of claim 19, wherein an apex of the at least one substantially pointed tip has a diameter of less than about 50 nm.